CLAIMS

What is claimed is:

1. A line restoring method comprising the steps of:

monitoring each occurrence of a failure preventing transmission to each of succeeding transmission sections of a plurality of redundantly configured transmission paths;

recognizing an attribute of a packet to be relayed as a connectionless service from a preceding transmission section of a specific transmission path, of said plurality of transmission paths, to its succeeding transmission section while a failure in the specific transmission path continues to exist; and

relaying said packet by using one of said plurality of transmission paths other than said specific transmission path when the recognized attribute indicates that said packet is a subject of a best effort service.

2. A line restoring method comprising the steps of:

forming in advance active paths and reserve paths capable of substituting the active paths in each of a plurality of redundantly configured transmission paths;

monitoring each occurrence of a failure preventing transmission to a succeeding transmission section of said active paths,;

recognizing an attribute of a packet to be relayed from a preceding transmission section of a specific active path, of said active paths, to its succeeding transmission section while a failure in the specific active path continues to exist; and

relaying said packet by using one of said reserve paths capable of substituting said specific active path when the recognized attribute indicates that said packet is a subject of either a control-loaded service or a guaranteed service.

3. A line restoring method comprising the steps of:

forming in advance active paths individually in all or part of a plurality of redundantly

configured transmission paths and forming reserve paths capable of substituting each part of the active paths in transmission paths other than where the active paths have been formed;

monitoring each occurrence of a failure preventing transmission to each of succeeding transmission sections of said plurality of transmission paths,;

recognizing an attribute of a packet to be relayed from a preceding transmission section of a specific transmission path, of said plurality of transmission paths, to its succeeding transmission section while a failure in the specific transmission path continues to exist; and

relaying said packet by using one of said plurality of transmission paths other than said specific transmission path when the recognized attribute indicates that said packet is a subject of a best effort service, and relaying said packet by using one of said reserve paths formed in advance in a transmission path other than said specific transmission path when the recognized attribute indicates that said packet is a subject of either a control-loaded service or a guaranteed service.

4. A line restoring method according to claim 1, wherein

said plurality of transmission paths: is duplexed, circularly formed, and has opposite transmission directions; and

relays said packet according to loopback when said recognized attribute indicates that said packet is a subject of a best effort service.

5. A line restoring method according to claim 2, wherein

said plurality of transmission paths: is duplexed, circularly formed, and has opposite transmission directions; and

relays said packet according to explicit routing when said attribute indicates that said packet is a subject of either a control-loaded service or a guaranteed service.

6. A packet transmission equipment comprising:

a plurality of interfacing section for interfacing the packet transmission equipment with each of redundantly configured simplex transmission paths in a physical layer;

failure detecting section for detecting, in said physical layer, a failure in each of preceding transmission sections of said transmission paths; and

communication controlling section for terminating said transmission paths via said plurality of interfacing section in a transport label layer and transmitting an alarm packet indicating a failure detected by said failure detecting section to all or part of succeeding transmission sections of said transmission paths.

7. A packet transmission equipment according to claim 6,

wherein said communication controlling section adds an identifier of a transmission path where a failure has been detected by said failure detecting section, to said alarm packet.

8. A packet transmission equipment comprising:

interfacing section for interfacing the packet transmission equipment with each of redundantly configured simplex transmission paths in a physical layer;

storage section for registering in advance, an identifier of a transmission path which conforms to a pair of (a) a combination of defective transmission sections of the transmission paths and (b) either or both of a sender and a destination of a packet to be transmitted to one of succeeding transmission sections of said transmission paths,

and where the identifier is of a transmission path in which transmission of the packet is to be actually allowable; and

communication controlling section for terminating said transmission paths via said interfacing section in a transport label layer and transmitting a packet to a succeeding transmission section of a transmission path which conforms to a pair of (a) either or both of a sender and a destination of the packet and (b) the identifier

and which is indicated by an identifier registered in said storage section, when

receiving an alarm packet including an identifier of a transmission section of said transmission paths and indicating that the transmission section is defective.

9. A packet transmission equipment according to claim 8,

wherein said storage section registers identifiers of a path to be formed to said destination in said transport label layer, in ascending order of the number of times crossing-over of different transmission paths performed.

10. A packet transmission equipment according to claim 8,

wherein corresponding to said combination of defective transmission sections, said storage section registers in advance identifiers of transmission paths having succeeding transmission sections not included in said combination.

11. A packet transmission equipment according to claim 8,

wherein said storage section registers an identifier in a manner that transmission of said packet is positively allowable to a normal transmission section of a transmission path including a defective transmission section as long as said path is formed in said transport label layer.

12. A packet transmission equipment according to claim 6, further comprising transmitter buffering section for accumulating a packet received from a preceding transmission section of said transmission paths and to be relayed to its succeeding transmission section, and wherein

said communication controlling section discards a packet which is accumulated in said transmitter buffering section and is to be relayed to a succeeding transmission section of a defective transmission section where a failure has been detected or which is defective, and adds a combination of a sender and a number to be used for packet sequencing, included in the discarded packet, to said alarm packet.

13. A packet transmission equipment according to claim 8, further comprising

transmitter buffering section for accumulating a packet received from a transmission section preceding said transmission paths and to be relayed to its succeeding transmission section, and wherein

said communication controlling section discards a packet which is accumulated in said transmitter buffering section and is to be relayed to a succeeding transmission section of a defective transmission section where a failure has been detected or which is defective, and adds a combination of a sender and a number to be used for packet sequencing, included in the discarded packet, to said alarm packet.

14. A packet transmission equipment comprising:

a plurality of interfacing section for interfacing the packet transmission equipment with each of redundantly configured simplex transmission paths in a physical layer;

failure detecting section for detecting a failure of said interfacing section in said physical layer; and

communication controlling section for terminating said transmission paths via said plurality of interfacing section in a transport label layer and transmitting an alarm packet indicating a failure detected by said failure detecting section and interfacing section, of said plurality of interfacing section, where the failure has been detected, to all or part of succeeding transmission sections of said transmission paths.

15. A packet transmission equipment according to claim 14,

wherein said communication controlling section adds an identifier, indicating a form of a failure in said interfacing section detected by said failure detecting section, to said alarm packet.

16. A packet transmission equipment comprising:

a plurality of interfacing section for interfacing the packet transmission equipment with each of redundantly configured simplex transmission paths in a physical layer;

storage section for registering in advance an identifier of a transmission path which conforms to a pair of (a) either or both of a sender and a destination of a packet to be transmitted to one of succeeding transmission sections of said transmission paths and (b) a combination of either or both of said interfacing section where a failure has been occurred and a form of the failure,

and where the identifier is of a transmission path in which transmission of the packet is to be actually allowable; and

communication controlling section for terminating said transmission paths via said plurality of interfacing section in a transport label layer and transmitting a packet to a succeeding transmission section of a transmission path which conforms to a pair of (a) either or both of a sender and a destination of the packet and (b) the interfacing section,

and which is indicated by an identifier registered in said storage section, when receiving an alarm packet indicating an interfacing section where a failure has been occurred.

17. A packet transmission equipment according to claim 16,

wherein a form of a failure in said plurality of interfacing section signifies whether or not each of said interfacing section is able to receive a predetermined packet from a preceding transmission section of a transmission path connected with each of said interfacing section.

18. A packet transmission equipment according to claim 16,

wherein a form of failure in said plurality of interfacing section signifies whether or not each of said interfacing section is able to transmit a predetermined packet to a succeeding transmission section of a transmission path connected with each of said interfacing section.

19. A packet transmission equipment according to claim 16,

wherein said storage section registers said identifiers of a path to be formed to said

destination in said transport label layer, in ascending order of the number of times crossing-over of different transmission paths performed.

20. A packet transmission equipment according to claim 16,

wherein corresponding to said combination of said interfacing section where a failure has been occurred, said storage section registers in advance identifiers of transmission paths having a succeeding transmission section connected with interfacing section not included in said combination.

21. A packet transmission equipment according to claim 16,

wherein said storage section registers an identifier in a manner that transmission of said packet is positively allowable to a normal transmission section of a transmission path including a transmission section connected with said interfacing section where a failure has been occurred as long as a normal path is formed in said transport label layer.

22. A packet transmission equipment according to claim 6,

wherein said communication controlling section relays an alarm packet received from preceding transmission sections of said transmission paths, to all or part of succeeding transmission sections of said transmission paths.

23. A packet transmission equipment according to claim 8,

wherein said communication controlling section relays an alarm packet received from preceding transmission sections of said transmission paths, to all or part of succeeding transmission sections of said transmission paths.

24. A packet transmission equipment according to claim 14,

wherein said communication controlling section relays an alarm packet received from preceding transmission sections of said transmission paths, to all or part of transmission sections succeeding said transmission paths.

25. A packet transmission equipment according to claim 16,

wherein said communication controlling section relays an alarm packet received from preceding transmission sections of said transmission paths, to all or part of succeeding transmission sections of said transmission paths.

26. A packet transmission equipment according to claim 14, further comprising transmitter buffering section for accumulating a packet received from a preceding transmission section of said transmission paths and to be relayed to its succeeding transmission section, and wherein

said communication controlling section discards a packet which is accumulated in said transmitter buffering section and is to be relayed to a succeeding transmission section via interfacing section where said failure has been detected, and adds a combination of a sender and a number to be used for packet sequencing, included in the discarded packet, to said alarm packet.

27. A packet transmission equipment according to claim 16, further comprising transmitter buffering section for accumulating a packet received from a preceding transmission sections of said transmission paths and to be relayed to its succeeding transmission section, and wherein

said communication controlling section discards a packet which is accumulated in said transmitter buffering section and is to be relayed to a succeeding transmission section via interfacing section where said failure has been detected, and adds a combination of a sender and a number to be used for packet sequencing included in the discarded packet, to said alarm packet.

28. A packet transmission equipment according to claim 6, further comprising transmitter subbuffering section for accumulating a packet transmitted to a succeeding transmission section of said transmission paths, and wherein

said communication controlling section when receiving said alarm packet, transmits

with priority a packet accumulated in said transmitter subbuffering section and including a sender and a number same as those included in said alarm packet.

29. A packet transmission equipment according to claim 8, further comprising transmitter subbuffering section for accumulating a packet transmitted to a succeeding transmission section of said transmission paths, and wherein

said communication controlling section when receiving said alarm packet, transmits with priority a packet accumulated in said transmitter subbuffering section and including a sender and a number same as those included in said alarm packet.

30. A packet transmission equipment according to claim 14, further comprising transmitter subbuffering section for accumulating a packet transmitted to a succeeding transmission sections of said transmission paths, and wherein

said communication controlling section when receiving said alarm packet, transmits with priority a packet accumulated in said transmitter subbuffering section and including a sender and a number same as those included in said alarm packet.

31. A packet transmission equipment according to claim 16, further comprising transmitter subbuffering section for accumulating a packet transmitted to a succeeding transmission section of said transmission paths, and wherein

said communication controlling section when receiving said alarm packet, transmits with priority a packet accumulated in said transmitter subbuffering section and including a sender and a number same as those included in said alarm packet.